Figure 1: Screening libraries of chimeric promoter sequences
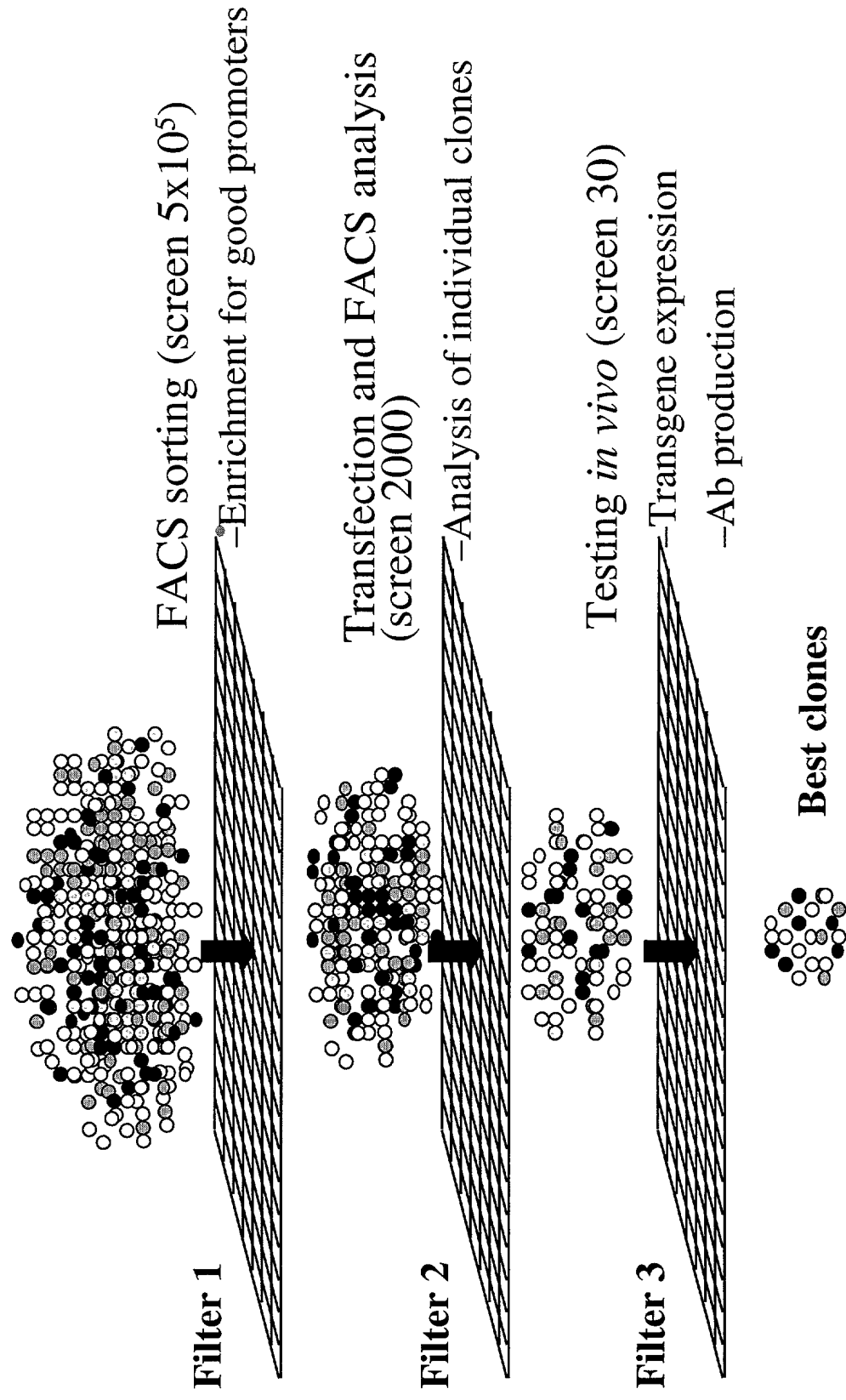
FACS sorting (screen 5x10^5)
–Enrichment for good promoters

Transfection and FACS analysis (screen 2000)
–Analysis of individual clones

Testing *in vivo* (screen 30)
–Transgene expression
–Ab production

Filter 1

Filter 2

Filter 3

Best clones

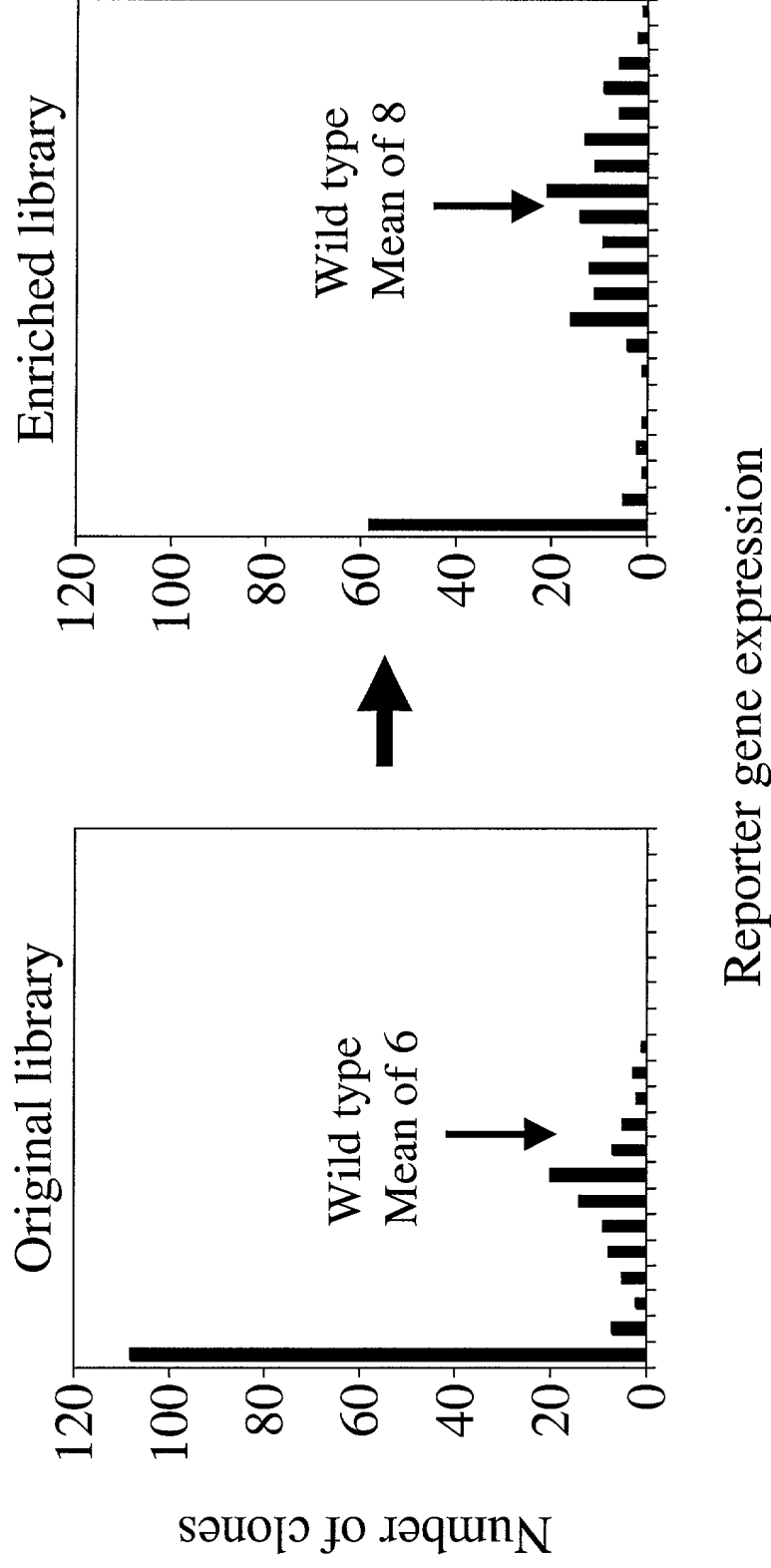# Figure 2: Enrichment of chimeric promoter libraries by FACS sorting

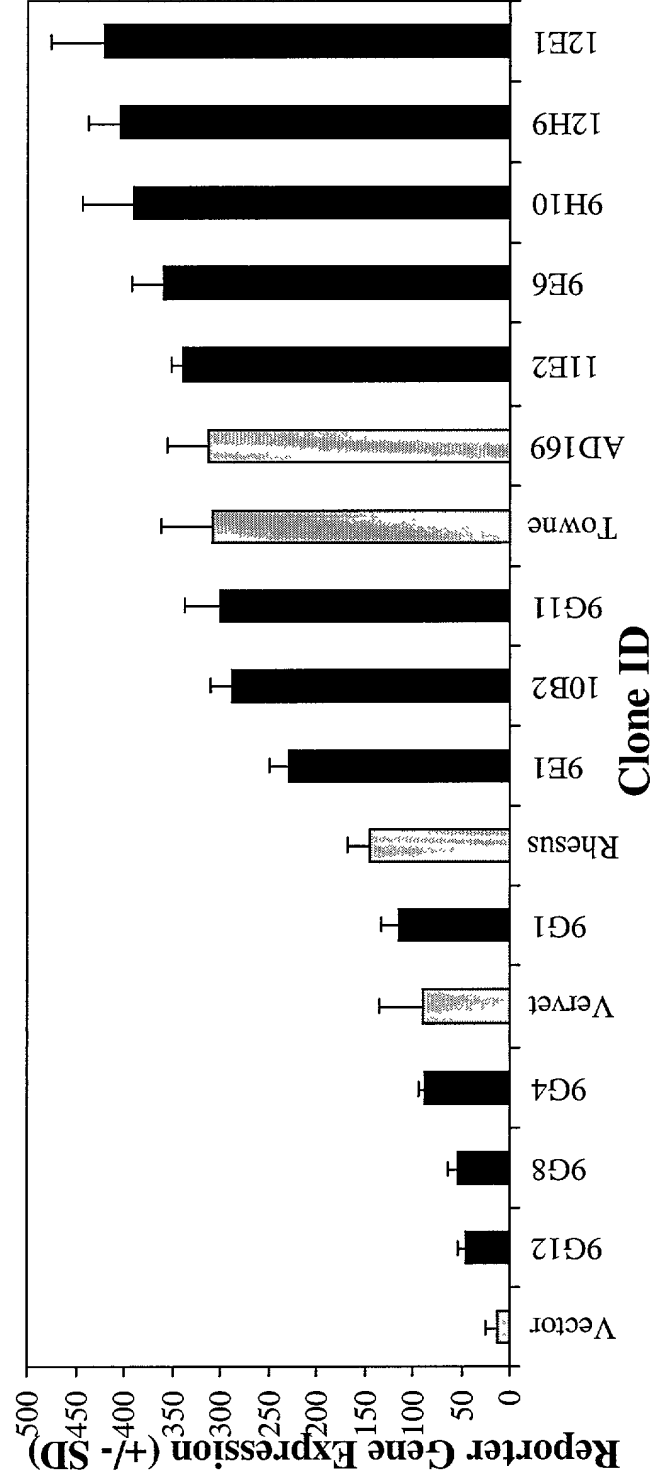# Figure 3: Diverse activities of chimeric promoter sequences in transfected cells

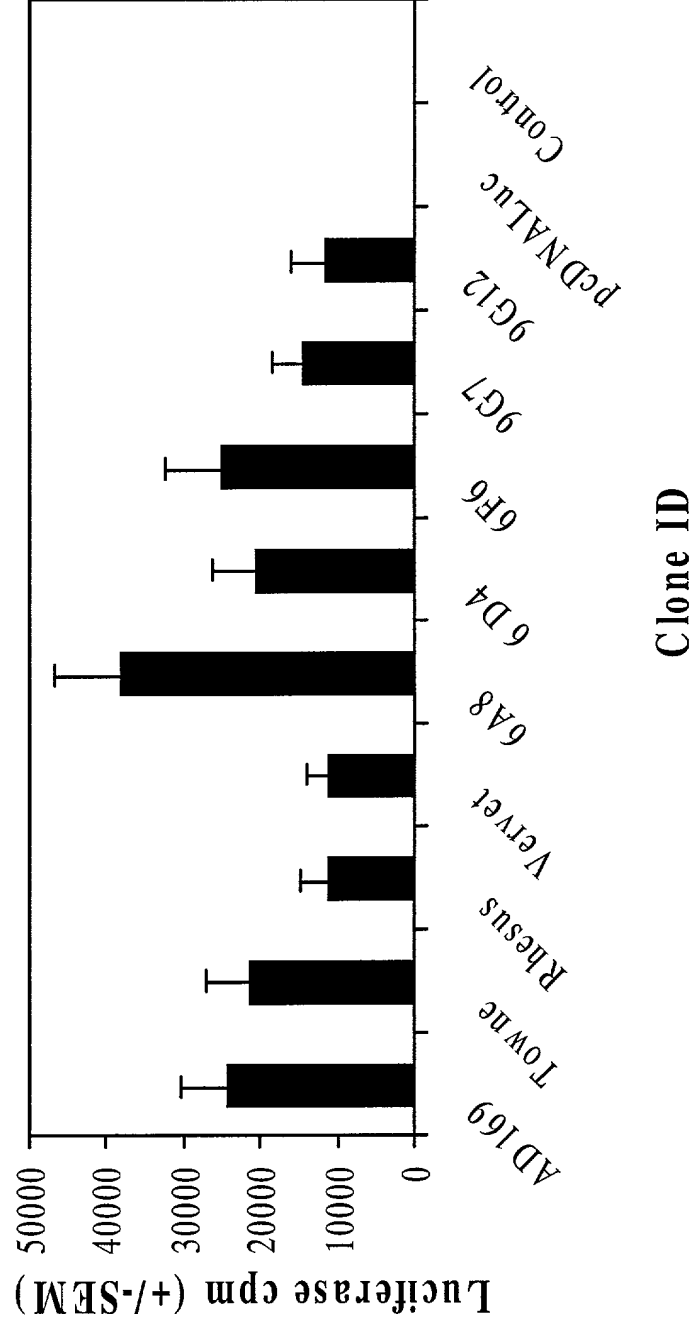# Figure 4: Luciferase expression in muscle 7 days after plasmid injection

Figure 5: Comparison of Luciferase expression from clone 6A8 and parental clones
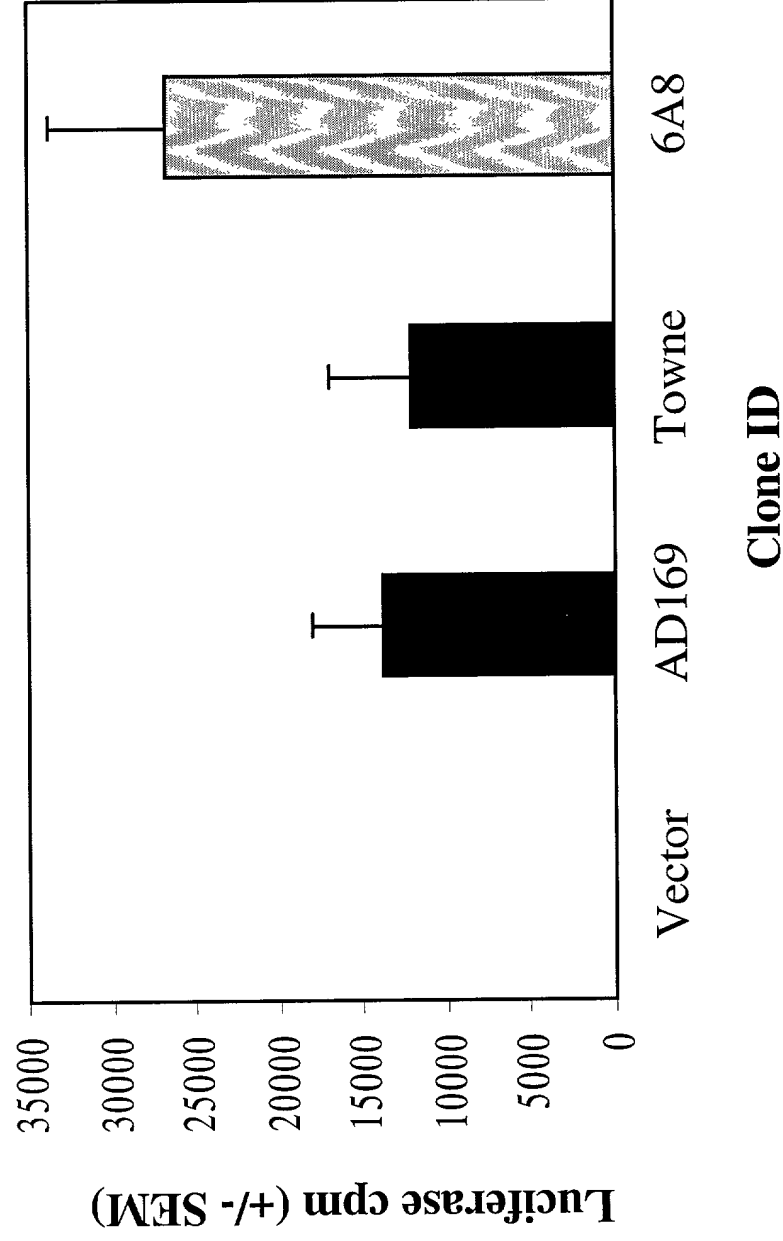
Figure 6A: Antibody responses following injection with β-galactosidase-encoding plasmid
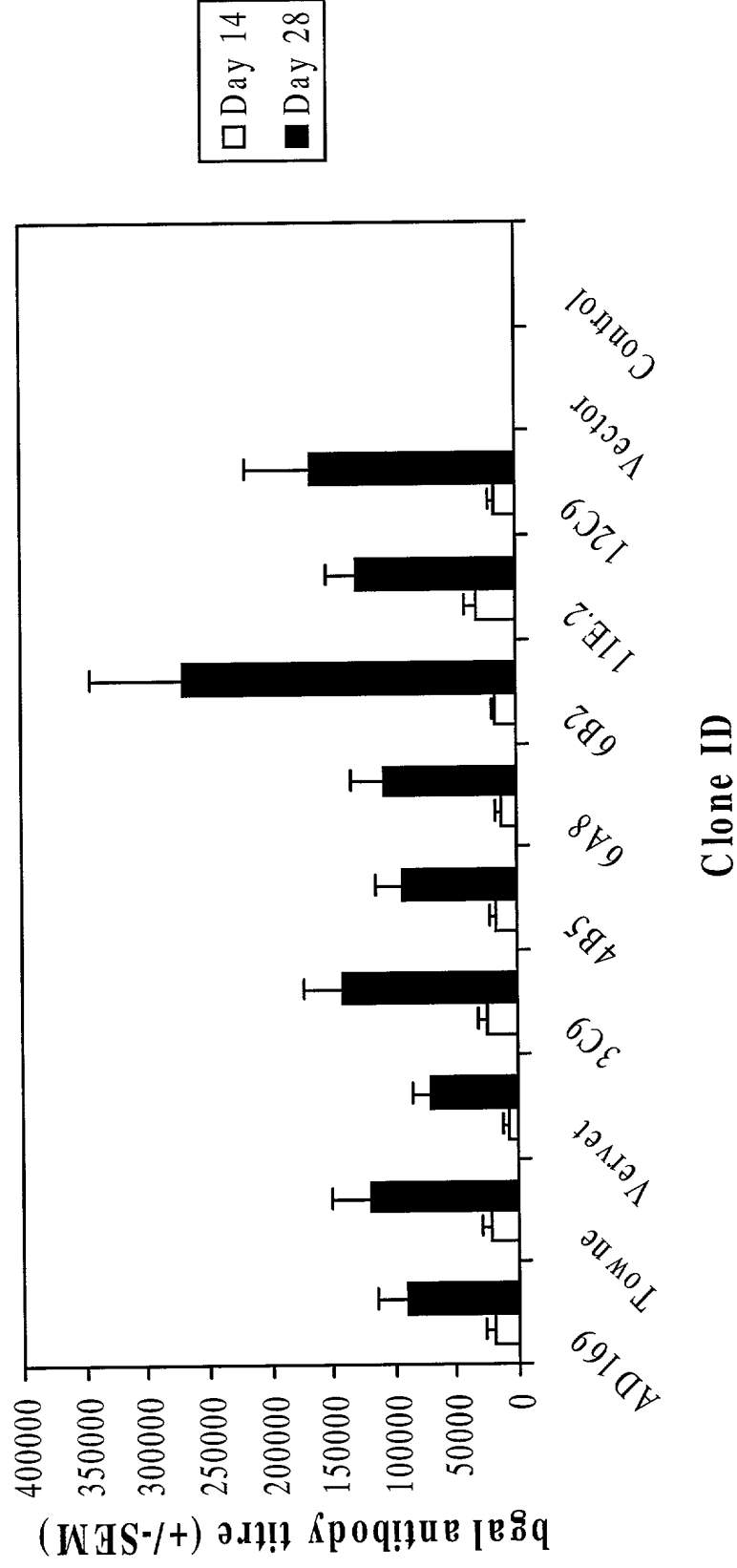
Figure 6B: Improved Ab Response by Shuffled Promoter

Ab titer x 10^{-4} (β-gal)

Control Rhesus Vervet Towne AD169 12E1

Figure 7: Chimeric promoter 6A8 is functional in human muscle tissue

Figure 8A: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

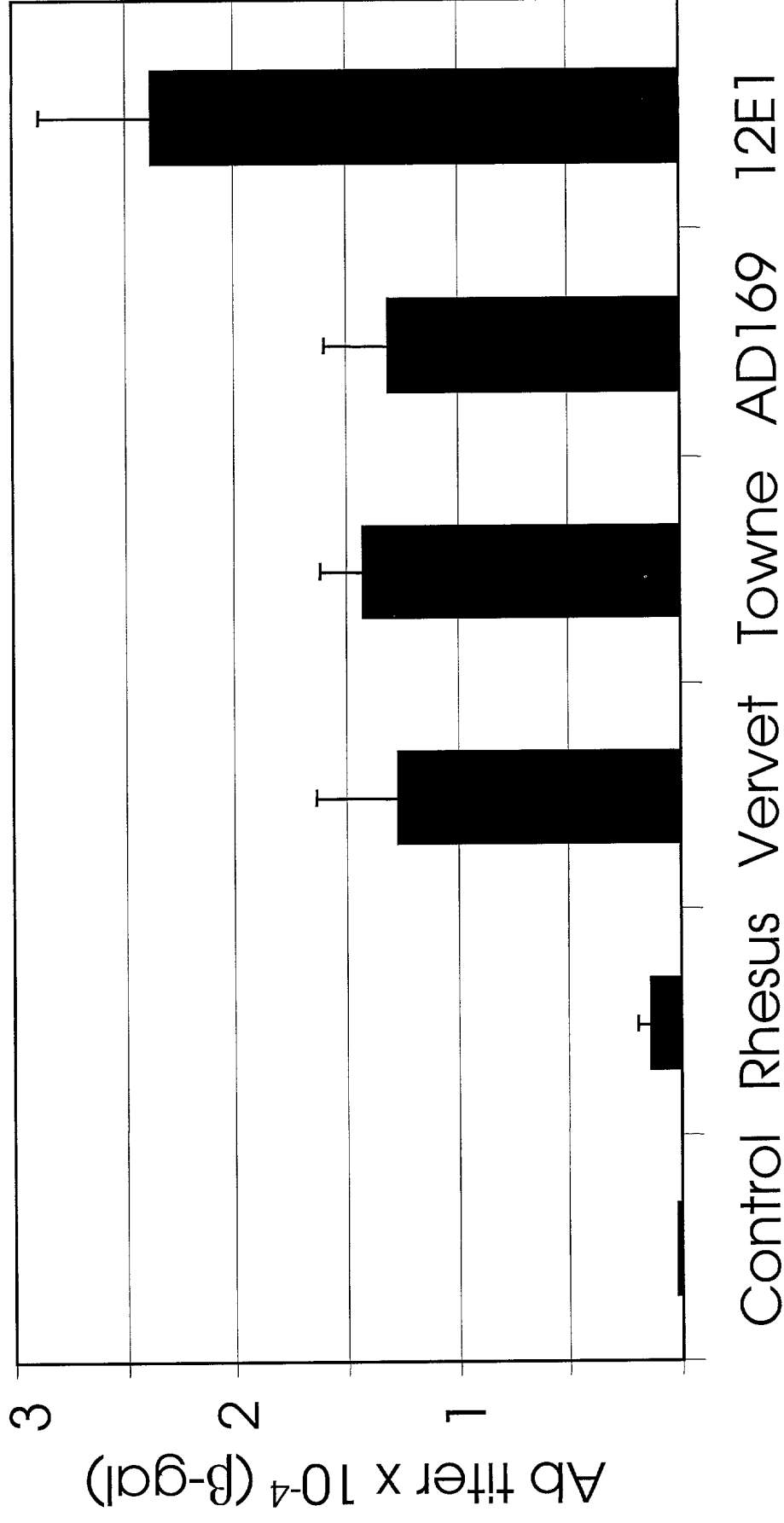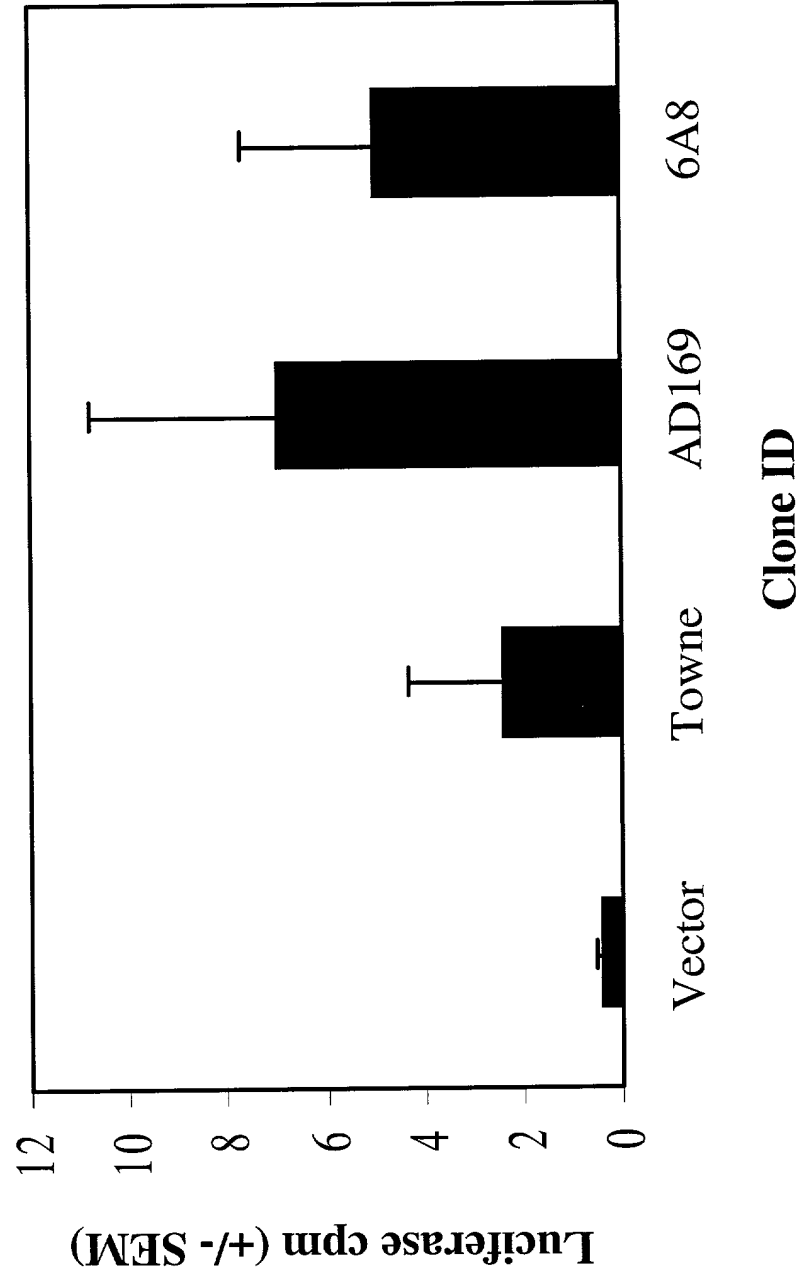Figure 8B: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                                                                                                          300
                  201
10B2       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAACTT
11E2       (201) ACTGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
12C9       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
12E1       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
12H9       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
3C9        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
4B5        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
6A8        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
6B2        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
6D4        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
6F6        (201) ACCGCCATGCTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATCAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9E1        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9F11       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9G11       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9G12       (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9G4        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9G7        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
9G8        (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
AD169      (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
Towne      (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT
Consensus  (201) ACCGCCATGTTGACATTGATTATTGACTAGTTATTAATAGTAATCAATCAAGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGCGTTACATAAACTT

                                                                                                          400
                  301
10B2       (301) ACGGTAAATGGCCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
11E2       (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
12C9       (301) ACGGTAAATGGCCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
12E1       (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
12H9       (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
3C9        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
4B5        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
6A8        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
6B2        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
6D4        (301) ACGGTAGATGGCCCGCCGCCTGGCCGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
6F6        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
9E1        (301) ACGGTAAATGGCCCGCCT---------------------------------------------------------------------------------------------
9F11       (301) ACGGTAGATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
9G11       (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
9G12       (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
9G4        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCACCGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
9G7        (301) ACGGTAAATGGCCTGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
9G8        (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
AD169      (301) ACGGTAAATGGCCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
Towne      (301) ACGGTAAATGGCCCGCCTCG-TGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
Consensus  (301) ACGGTAAATGGCCCGCCGCCTGGCTGACGCGCCCAACGACCCCCGCCCCATTGACGTCAATAATGACGTATGTTCCCATAGTAACGCCAATAGGGACTTTCCATT
```

Figure 8C: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.


```
                  401                                                                                    500
10B2      (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
11E2      (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCTCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
12C9      (401)   GACGTCAATGGGTGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
12E1      (401)   GACGTCAATGGGTGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
12H9      (401)   GACGTCAATGGGTGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
3C9       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCGCCCCCCTATTGACGTCAATGACGGTA
4B5       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
6A8       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
6B2       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
6D4       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
6F6       (401)   GACGTCGATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
9E1       (319)   ---------------------------------------------------------------------------------------------------
9F11      (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
9G11      (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACGTCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
9G12      (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACGTCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
9G4       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG-CCCCCTATTGACGTCAATGACGGTA
9G7       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGTCAAGTCCG-CCCCCTATTGACGCCAATGACGGTA
9G8       (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACG-CCCCCTATTGACGTCAATGACGGTA
AD169     (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTACGCCCCC-TATTGACGTCAATGACGGTA
Towne     (400)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCGGCCCCCTATTGACGTCAATGACGGTA
Consensus (401)   GACGTCAATGGGTGGAGTATTTACGGTAAACTGCCCACTTGGCAGTACATCAAGTGTATCATATGCCAAGTCCG  CCCCCTATTGACGTCAATGACGGTA

                  501                                                                                    600
10B2      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
11E2      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
12C9      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
12E1      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
12H9      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
3C9       (501)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
4B5       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
6A8       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
6B2       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
6D4       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
6F6       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTGTTACCGCTATTACCATGGTGATGCG
9E1       (319)   ------GGCATTATGCCCAGTACATGACCTTATGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
9F11      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
9G11      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
9G12      (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTGCGTATTACCGCTATTACCATGGTGATGCG
9G4       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
9G7       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGTATTACCATGGTGATGCG
9G8       (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
AD169     (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTATGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
Towne     (500)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
Consensus (501)   AATGGCCCGCCTGGCATTATGCCCAGTACATGACCTTACGGGGACTTTCCTACTTGGCAGTACATCTACGTATTAGTCATCGCTATTACCATGGTGATGCG
```

Figure 8D: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                601                                                                                                   700
10B2    (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
11E2    (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
12C9    (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
12E1    (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGG----------
12H9    (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
3C9     (601)   GTTTTGGCGGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
4B5     (600)   GTTTTGGCAGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGG----------
6A8     (600)   GTTTTGGCAGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
6B2     (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGG----------
6D4     (600)   GTTTTGGCAGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGG----------
6F6     (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9E1     (407)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9F11    (600)   GTTAGGCAGTACACCACCAATGGGCGTAGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9G11    (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9G12    (600)   GTTTTGGCGGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9G4     (600)   GTTTTGGCGGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9G7     (600)   GTTTTGGCAGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
9G8     (600)   GTTTTGGCAGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
AD169   (600)   GTTTTGGCAGTACATCAATCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
Towne   (600)   GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA
Consensus(601)  GTTTTGGCAGTACACCACCAATGGGCGTGGATAGCGGTTTGACTCACTCACGGGGATTTCCAAGTCTCCACCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAA

                701                                                                                                   800
10B2    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAATGCTCGTT
11E2    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
12C9    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACTCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAATGCTCGTT
12E1    (683)   --------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
12H9    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
3C9     (701)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
4B5     (683)   --------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
6A8     (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
6B2     (683)   --------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
6D4     (683)   --------------------------------CGGTCCTATGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
6F6     (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9E1     (507)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9F11    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCC-GTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9G11    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9G12    (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9G4     (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9G7     (700)   AGTCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
9G8     (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
AD169   (700)   AATCAACGGGGACTTTCCAAAATGTCGTAAACAACTCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
Towne   (700)   AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGG-AGGTCTATATAAGCAGAGCTCGTT
Consensus(701)  AATCAACGGGGACTTTCCAAAATGTCCAAAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGCGGTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTT
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Figure 8E: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                 801                                                                                           900
10B2       (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
11E2       (800) TAGGGAACCGCCATTCTGCCTGGGGACGC------CGGAG-----GAGCTCCATTGGAAGAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
12C9       (800) TAGGGAACCGCCATTCTGCCTGGGGACGC------CGGAG-----GAGCACCAT-AGAAGACACCGGGACCGATCCAGCCTCCATAGCCGGCGCCGGGAACGGGTGCA
12E1       (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
12H9       (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
3C9        (801) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
4B5        (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
6A8        (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
6B2        (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
6D4        (748) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
6F6        (800) TAGTGAACCGCCATTCTGCCTGGGGACGT------CGGAG-----GAGCACCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9E1        (607) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9F11       (799) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9G11       (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9G12       (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-GGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9G4        (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9G7        (800) TAGGGAACCGTCATTCTGCCTGGGGACG-----TCGGAG----GAGCACCAT-AGAAGTACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
9G8        (800) TAGGGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-GGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
AD169      (799) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGGACGGGTGCA
Towne      (800) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA
Consensus  (801) TAGTGAACCGTCAGATCGCCTGGAGACGCCATCCACGCTGTTTGACCTCCAT-AGAAGACACCGGGACCGATCCAGCCTCCGCGCCGGGAACGGGTGCA

                 901                                                                                          1000
10B2       (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
11E2       (890) TTGGAACGCGGATTCCCCGTGCCCCGTGCCGAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
12C9       (889) TTGGAACGC---------
12E1       (847) TTGGAACGCGGATTCCCCGTGCCAA-AGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
12H9       (899) TTGGAACGCGGATTCCCCGTGCCCCGTGCCGAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
3C9        (900) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
4B5        (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
6A8        (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
6B2        (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
6D4        (847) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTAGGACTCTATAGGCCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
6F6        (889) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9E1        (706) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9F11       (898) TTGGAACGCGGATTCCCCGTGCCAA-AGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9G11       (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9G12       (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9G4        (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACATAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9G7        (889) TTGGAACGCGGATCCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
9G8        (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
AD169      (898) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
Towne      (899) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT-CTTATGCATGCTATACTGTTTTTGG
Consensus  (901) TTGGAACGCGGATTCCCCGTGCCAAGAGTGACGTAAGTACCGCCTATAGGACTCTATAGGCACACCCCTTTGGCT CTTATGCATGCTATACTGTTTTTGG
```

Figure 8F: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                   1001                                                                                      1100
10B2       (998)   CTTGGGGTCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
11E2       (989)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCATCCCCTATTGG
12C9       (898)   ------------------------------------------------------------------------------------------------
12E1       (947)   CTTGGGGTCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
12H9       (998)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
3C9        (999)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
4B5        (946)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
6A8        (998)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
6B2        (946)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
6D4        (946)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
6F6        (988)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9E1        (805)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9F11       (996)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9G11       (998)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9G12       (998)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9G4        (998)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9G7        (988)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
9G8        (998)   CTTGGGGCCTATACACCCCCGCTTCCTTATGCTCATGTTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
AD169      (998)   CTTGGGGTCTATACACCCCCGCTTCCTTATGCTCATGTTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
Towne      (998)   CTTGGGGCCTATACACCCCCGCT-CCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG
Consensus  (1001)  CTTGGGGCCTATACACCCCCGCTTCCTTATGCTATAGGTGATGGTATAGCTTAGCCTATAGGTGTGGGTTATTGACCATTATTGACCACTCCCCTATTGG

                   1101                                                                                      1200
10B2       (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
11E2       (1089)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAGCTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
12C9       (898)   ------------------------------------------------------------------------------------------------
12E1       (1047)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
12H9       (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACAGGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
3C9        (1099)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
4B5        (1046)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
6A8        (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
6B2        (1046)  TGACGATACTTTTCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
6D4        (1046)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
6F6        (1088)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
9E1        (905)   TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
9F11       (1096)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
9G11       (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
9G12       (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
9G4        (1088)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGGCTGACACGGAC
9G7        (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
9G8        (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
AD169      (1098)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
Towne      (1097)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
Consensus  (1101)  TGACGATACTTTCCATTACTACTAATCCATAAACATGGCTCTCTTTGCCACAACTATCTCTATTGGCTATATGCTATATGCCAATACTCTGTCCTTCAGAGACTGACACGGAC
```

Figure 8G: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                    1201                                                                                        1300
10B2      (1198)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACACCACCGTCCCCAGTGCCCGCAGTTTTTGTTAAACATAGCGTGG
11E2      (1189)    TCTGTATTTTTTACAGGATGGGGTCTCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
12C9      (898)     --------------------------------------------------------------------------------------------------------
12E1      (1147)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
12H9      (1198)    TCTGTATTTTTTACAGGATGGGGTCTCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
3C9       (1199)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
4B5       (1146)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
6A8       (1198)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
6B2       (1146)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
6D4       (1146)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
6F6       (1188)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
9E1       (1005)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
9F11      (1196)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
9G11      (1198)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
9G12      (1198)    TCTGTATTTTTTACAGGATGGGGTCTCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
9G4       (1198)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
9G7       (1188)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTCTTTATTAAACATAGCGTGG
9G8       (1198)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
AD169     (1198)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACACCACCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAACGTGG
Towne     (1197)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATGTACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG
Consensus (1201)    TCTGTATTTTTTACAGGATGGGGTCCCATTTATTTATTTTTACAAATTCACATATACAACAACGCCGTCCCCGTGCCCGCAGTTTTTTATTAAACATAGCGTGG

                    1301                                                           1400
10B2      (1298)    GATCTCCACGCAAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGCGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
11E2      (1289)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
12C9      (898)     --------------------------------------------------------------------------------------------------------
12E1      (1247)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTGATCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTGAGCTCCCATGCCTCCAGCGGC
12H9      (1298)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTGAGCTCCCATGCCTCCAGCGGC
3C9       (1299)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
4B5       (1246)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
6A8       (1298)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
6B2       (1246)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
6D4       (1246)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
6F6       (1288)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
9E1       (1105)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
9F11      (1296)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
9G11      (1298)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
9G12      (1298)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
9G4       (1298)    GATCTCCACGCAAATCTCGGGTACGTGTTCCGGGCATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGAC
9G7       (1288)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
9G8       (1298)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
AD169     (1298)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCTACATCCGAGCCCTGGTCCCATGCCTCCAGCGGAC
Towne     (1297)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
Consensus (1301)    GATCTCCACGCGAATCTCGGGTACGTGTTCCGGACATGGGCTCTTCTCCGGTAGGGGCGGCGGAGCTTCCACATCCGAGCCCTGGTCCCATGCCTCCAGCGGC
```

Figure 8H: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                      1401                                                                                          1500
10B2      (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
11E2      (1389)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
12C9      (898)   ------------------------------------------------------------------------------------------------
12E1      (1347)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTATGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
12H9      (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTATGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
3C9       (1399)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
4B5       (1346)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
6A8       (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
6B2       (1346)  TCATGGTCGCTCGGCAGCTCCTTGCTCCCAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
6D4       (1346)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
6F6       (1388)  TCATGGTCGCTCGGCAGCCCCTTGCTCCTCCAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9E1       (1205)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9F11      (1396)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9G11      (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9G12      (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9G4       (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9G7       (1388)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
9G8       (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
AD169     (1398)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
Towne     (1397)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACGATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG
Consensus (1401)  TCATGGTCGCTCGGCAGCTCCTTGCTCCTCCTAACAGTGGAGGCCAGACTTAGGCACAGCACAATGCCACCACCACCAGTGTGCCGCACAAGGCCGTGGCGG

                      1501                                                                                           1600
10B2      (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
11E2      (1489)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
12C9      (898)   ------------------------------------------------------------------------------------------------------
12E1      (1447)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
12H9      (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGGCGCTTGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
3C9       (1499)  TAGGGTATGTGTCTGAAAATGAGCTCGG--AGTGGGCTTGCACCGCTCGACGCGCAGATTTGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
4B5       (1446)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
6A8       (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGGAGATCGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
6B2       (1446)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
6D4       (1446)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
6F6       (1488)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9E1       (1305)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9F11      (1496)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9G11      (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9G12      (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9G4       (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9G7       (1488)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
9G8       (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
AD169     (1498)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCG--TGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
Towne     (1497)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
Consensus (1501)  TAGGGTATGTGTCTGAAAATGAGCTCGGAGATTGGGCTCGCACCGCTCGACGCGCAGATGGAAGACTTAAGGCAGCGGCAGAAGAAGATGCAGGCAGCTGAGT
```

Figure 8I: Comparison of 18 chimeric promoter sequences generated by DNA shuffling using CMV promoter nucleic acid sequences from AD169 and Towne human strains and Rhesus and Vervet monkey strains as parental sequences.

```
                        1601                                                                                1700
10B2      (1598)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
11E2      (1589)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
12C9      ( 898)  ------------------------------------------------------------------------------------------
12E1      (1547)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
12H9      (1598)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
3C9       (1597)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
4B5       (1546)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
6A8       (1598)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
6B2       (1546)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
6D4       (1546)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
6F6       (1588)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
9E1       (1405)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
9F11      (1596)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
9G11      (1598)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
9G12      (1598)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCAATGTAGTCGTTGCTGCGCGCGCGCC
9G4       (1598)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGCGGAGGGCAGTGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
9G7       (1588)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
9G8       (1598)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
AD169     (1598)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
Towne     (1596)  TGTTGTGTTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC
Consensus (1601)  TGTTGTATTCTGATAAGAGTAGTCAGAGGTAACTCCCGTTGCGGTGCTGTTAACGGTGCGGTGCTGAGCAGTAGTCGTTGCTGCGCGCGCGCC

                        1701                                                    1770
10B2      (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
11E2      (1689)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
12C9      ( 898)  ---------------------------------------------------------
12E1      (1647)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
12H9      (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
3C9       (1697)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
4B5       (1646)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
6A8       (1698)  ACCAGACATAATAGCTGACAGACTAACAGGACTGTTCCTTTCTGCAGTCACCGTCCTT
6B2       (1646)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
6D4       (1646)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCTT-
6F6       (1688)  ACCAAACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9E1       (1505)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9F11      (1696)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9G11      (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9G12      (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9G4       (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9G7       (1688)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
9G8       (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
AD169     (1698)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
Towne     (1696)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
Consensus (1701)  ACCAGACATAATAGCTGACAGACTAACAGACTGTTCCTTTCTGCAGTCACCGTCCTT
```

FIGURE 9

Vector for promoter evolution
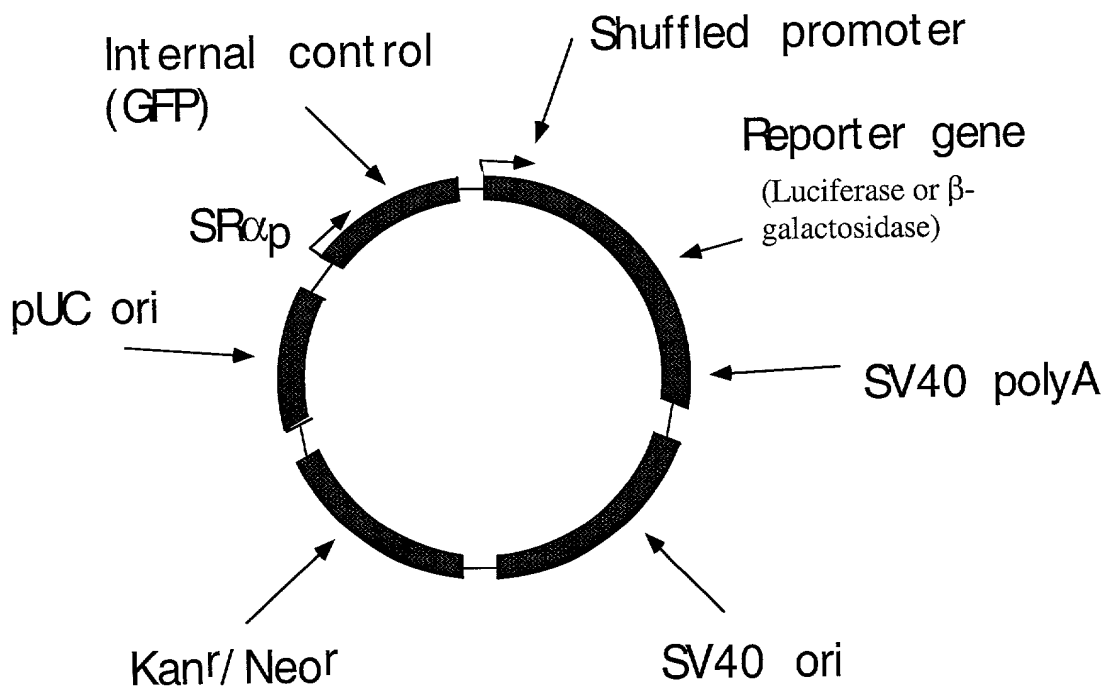
Internal control
(GFP)

Shuffled promoter

Reporter gene
(Luciferase or β-galactosidase)

SRαp

pUC ori

SV40 polyA

Kanʳ/ Neoʳ

SV40 ori

FIGURE 10A

```
                                  1                                                          60
Towne_promoter_fr_PCR_prod_seq    ATA....TGAGGCTATATCGCCGATAGAGGCGACATCAAGCTGGCACATGCCAATGCAT
Rhesus_monkey_PCR_prod_821bp      ACT....TGGCACGGTGCCAA.GTTTGGGGCGGGGGTC...TTGGCACGGTGCCAA.....
Vervet_(Simian)_PCR_product_seq   ATTGAATTGGCATGGTGCCAATAATGGCGGC..CATA...TTGGCTATATGCCA.......

                                  61                                                        120
Towne_promoter_fr_PCR_prod_seq    ATCGATCTATACACATTGAATCAATATTGGCAATTAGCCATATTAGTCATTGGTTATATAGC
Rhesus_monkey_PCR_prod_821bp      ...GTCCGCCATATTGGTTTGGCAT.....ATGTCCAATATATTGAT...CCATATAGC
Vervet_(Simian)_PCR_product_seq   .............GGATCAATAT.....ATAGGCAATATC........CAATATGGC

                                  121                                                       180
Towne_promoter_fr_PCR_prod_seq    ATAAAATCAATATTGGCTATTGGCCATTGCATAACGTTGTATCTATATCATAATATGTACAT
Rhesus_monkey_PCR_prod_821bp      CAATATCCAATATGGCTAATAGCCA.........GGTTCAATAGAATGGCCAATAAGC
Vervet_(Simian)_PCR_product_seq   CCTATGCCAATATGGCTATTGGCCA.........GGTTCAATACTATGTATTGGCCCT

                                  181                                                       240
Towne_promoter_fr_PCR_prod_seq    TTATATTGGCTCATGTCCAATATGACCGCCATGTTGACATTGATTATTGACTAGTT..AT
Rhesus_monkey_PCR_prod_821bp      CAATAT..GCCATTGGCCAACATGGCAA.TGGGCCAGTATTGATTATAGCCAATAT..AT
Vervet_(Simian)_PCR_product_seq   ATGCCA..TATAGTATTCCATATATATGGGTTTTCCTATTGACGTAGATAGCCCCTCCCAAT
```

FIGURE 10B

```
241
Towne_promoter_fr_PCR_prod_seq    TAATAGTA......ATCAATTACGGGGTCATTAGTTCATAGCCCATATATGGAGTTCCGC
Rhesus_monkey_PCR_prod_821bp      AGGCAATA......ATCCATATTGG...CATATGTCCATATTGCCTATAGCCATATTGGC
Vervet_(Simian)_PCR_product_seq   GGGCGGTCCCATATACCATATATGG...GGCTTCCTAATACCGCCCATAGCCACTCCCCC
                                                                                              300

301
Towne_promoter_fr_PCR_prod_seq    GT...T..ACATAACTTACGGTAAATGGCCCGCCCTCGTGACCGCCCAACGACCCCCGCCC
Rhesus_monkey_PCR_prod_821bp      TTATGT..CCATTACCAATACCATATATGGGTCTTCCTATATACGTCATAGGTACCGCCC
Vervet_(Simian)_PCR_product_seq   AT...TGACGTCAATGGTCTCTATATATGGTCTTTCCTATTGACGTCATATGGGCGGTCC
                                                                                              360

361
Towne_promoter_fr_PCR_prod_seq    .ATTGACGT.........................................CAA
Rhesus_monkey_PCR_prod_821bp      .ATTGACGTAATATGGATACGCCTCCATTGACGTCAAATGGGAGGATTAATATACGTCAC
Vervet_(Simian)_PCR_product_seq   TATTGACGTA.TATGGCGCCTCCCCCCATTGACGTCAATTACGTCAATTACGGCCGCCTGGC
                                                                                              420

421
Towne_promoter_fr_PCR_prod_seq    TAATGACGTATGTTCCCAT...............AGTAACGCCAATAGGG..ACTTTCCA
Rhesus_monkey_PCR_prod_821bp      TAATACCGCCCATTGACGTGTATAGGACCGTCCATTGACGTCAATAGGCCCACCTCCCA
Vervet_(Simian)_PCR_product_seq   T..CAATGCCCATTGACGT...............CAATAGGACCACCCCACCA
                                                                                              480
```

FIGURE 10C

```
                                                                        540
481
Towne_promoter_fr_PCR_prod_seq   TTGACGTCAATGGGTGGAGTATTTACGGGTAAAACTGCCCACTT.........GGCAGTAC
Rhesus_monkey_PCR_prod_821bp     TTGACGTCAATGGG.........GTGGCCCATTGCCCATTC.......
Vervet_(Simian)_PCR_product_seq  TTGACGTCAATGGG.........ATGGCTCATTGCCCATTCATATCCGTTC.......

                                                                        600
541
Towne_promoter_fr_PCR_prod_seq   ATCAAGTGTATCATATGCCAAGTCCGGCCCCCTATTGACGTCAATGACGGTAAATGGCCC
Rhesus_monkey_PCR_prod_821bp     .........................CCACGCCCCTATTGACGTCAATGACGGTAAATGGCC.
Vervet_(Simian)_PCR_product_seq  .........................TCACGCCCCTATTGACGTCAATGACGGTAAATGGCC.

                                                                        660
601
Towne_promoter_fr_PCR_prod_seq   GCCTGGCATTATGCCCAGTACATGACCTTACGGGACTTTCCTACTTGGCAGTACATC..T
Rhesus_monkey_PCR_prod_821bp     .............................................CACTTGGCAGTACATCAAT
Vervet_(Simian)_PCR_product_seq  .............................................CACTTGGCAGTACATCAAT

                                                                        720
661
Towne_promoter_fr_PCR_prod_seq   ACGTATTAGTCATCGCTATTACCATGGTGATGCGGTTTTGGCAGTACACCAA.........
Rhesus_monkey_PCR_prod_821bp     ACCTATTAATAGTAACT..TGGCAAGTAAATGGGTACTTGGCAGTACCACCAAGG.TACAT
Vervet_(Simian)_PCR_product_seq  ATCTATTAATAGTAACT..TGGCAAGTACATTACTATTGGCAAGTACGCCCAAGGGTACAT
```

FIGURE 10D

```
                                     721                                                          780
Towne_promoter_fr_PCR_prod_seq    ................TGGGGCGTGGATAGCGGT..TTGACTCACGGGGATTTCCAAGTCTC
Rhesus_monkey_PCR_prod_821bp      TGGCAG.TACTCCCATTGACGTCAATGGCGGTAAATGGCCCGCAATGGCTGCCAAGTACA
Vervet_(Simian)_PCR_product_seq   TGGCAGGTACTCCCATTGACGTCAATGGCGGTAAATGGCCCGGCATGGCTGCCAAGTACA

                                     781                                                          840
Towne_promoter_fr_PCR_prod_seq    ...CACCCCCATTGACGTCAATGGGAGTTTGTTTTGGCACCAAAATCAACGGGACTTTCCA
Rhesus_monkey_PCR_prod_821bp      ...TGCCC.ATTGACGTCAATGGGG.................................
Vervet_(Simian)_PCR_product_seq   ACATCCCC.ATTGACGTCAATGGGAA.................................

                                     841                                                          900
Towne_promoter_fr_PCR_prod_seq    AAATGTCGTAATAACCCCGCCCCGTTGACGCAAATGGGGCG...................
Rhesus_monkey_PCR_prod_821bp      ............CGGTCCTATGACGTCAATGGGCG.........................
Vervet_(Simian)_PCR_product_seq   .........GGGGCAATGACGCAAATGGGCGTTCCATTGACGTAAATGGCG

                                     901                                                          960
Towne_promoter_fr_PCR_prod_seq    GTAGGCGTGTACGGTGGGAGGTCTATATAAGCAGAGCTCGTTTAGTGAACCGTCAGATCG
Rhesus_monkey_PCR_prod_821bp      GTAGGCGTGC.CTATGGGCGGTCTATATAAGCAATGCACGTTTAGGGAACCGCCATTCTG
Vervet_(Simian)_PCR_product_seq   GTAGGCGTGCCTAATGGGAGGTCTATATAAGCAATGCTCGTTCGTTTAGGGAACCGCCATTCTG
```

FIGURE 10E

```
                         961                                                        1020
Towne_promoter_fr_PCR_prod_seq        CCTGGAGACGCCATCCACGCTGTTTGACCTCCAT.AGAAGACACCGGG.ACCGATCCAG
Rhesus_monkey_PCR_prod_821bp          CCTGGGGACGTCG.........GAGGAGCACCAT.AGAAGGTACCGGGGACCGATCCAG
Vervet_(Simian)_PCR_product_seq       CCTGGGGACGTCG.........GAGGAGCTCCATTGGAAGAGACCGGG.ACCGATCCAG
```

```
                         1021                                    1057
Towne_promoter_fr_PCR_prod_seq        CCTCCGCGGCCGGGAACGGTGCATTGGAACGCGGATT          SEQ ID NO:20
Rhesus_monkey_PCR_prod_821bp          CCTCCATAGCCGGGAAGGGTGCATTGGAACGCGGATA         SEQ ID NO:22
Vervet_(Simian)_PCR_product_seq       CCTCCATAGCCGGGGACGGTGCATTGGAATGCGGATA         SEQ ID NO:23
```